H-4165

Harvard Miniature Compaction Apparatus

General
This test determines the relationship between the moisture content of soils and resulting densities (oven-dry weight per cubic foot) when the soil is compacted in the laboratory with this apparatus. Selection of the most appropriate number of layers, number of tamps per layer and tamping force depends on the type of material and the intended use to which the compacted material will be put. In general, at least five layers and ten tamps per layer are required to produce homogeneous test specimens.

Unpacking
In shipment, all of the parts are packed carefully to prevent damage. It is suggested that all packing material be carefully checked to ascertain that no parts are overlooked. The apparatus consists of the following:
Specimen ejector and collar remover with spacer plate
Mold holder
1/454 cu. ft. (129 m3)-volume mold & collar
Compaction tamper with 20 lb. (9.07kg), 37.5lb. (17kg) & 40lb (18.2kg) spring

Assembly
Very little assembly is required since the collar remover and specimen ejector is shipped completely assembled. To assemble the mold, place collar on the mold. Set in center of base plate with top of mold collar fitted into recess in top plate. Tighten knurled nuts. The tamper is supplied with 20-pound compaction spring in place. To change springs, remove the two lock nuts and remove insert in lower end by loosening the two set screws.

Sample Preparation
Air-dry to a slight to slightly damp condition a 2 to 3 lb. sample of soil taken from a portion of the material passing the No. 4 (4760-micron) sieve. Mix thoroughly to break up the lumps and insure a homogeneous mixture. Then divide into six to eight portions, such that each portion contains slightly more than enough material for one test. To each portion add approximately the required amount of water to obtain the desired range of moisture contents. After thorough mixing, place each portion in a small glass jar with tight fitting cover and store overnight or until ready for testing. For soils that mix readily with water and have low dry strengths, it is satisfactory to add water and mix the specimen immediately prior to testing. It is important that a compacted specimen not be remixed and used over again.

Test Procedure

1. With the mold and collar clamped to the base, place the desired amount of loose soil in the mold. For five layers, two slightly heaping teaspoonfuls will be required for each layer. Level the surface by pressing lightly with a wood plunger.
2. Insert the tamper in the mold until it is in contact with the surface of the soil and press down firmly until one feels that the spring is starting to compress. Releasethe force and shift the tamper to a new position. Each of the first four tamps should be applied in separate quadrants and adjacent to the mold. The fifth tamp should be in the center,

making one complete coverage. This cycle is then repeated until the desired number of tamps has been applied. The tamps should be applied at the approximate rate of 10 tamps per 15 sec.

3. Add the next layer and repeat the procedure until the required number of compacted layers has been placed. The top layer should extend at least ½ in. into the extension collar.
4. Remove mold from clamp. Insert spacer disc in collar remover and ejector. Place mold into device with lugs on the remover in the groove provided in the collar. Press down firmly on the piston and on the lever arm at the back, prying the collar free of the compacted soil.
5. Remove the mold from the base and carefully trim away the excess soil from the top of the mold and from the bottom, if any.
6. Weigh the mold containing the compacted soil to the nearest 0.1g. It is convenient to use a rare weight equal to the weight of the empty mold, as then the resulting net weight in grams is numerically equal to the wet unit weight of the compacted soil, in pounds per cubic foot.
7. Remove the specimen from the mold with the sample ejector and place in a suitable container for drying and determination of moisture content.
8. Compact additional specimens until points have been established on both sides of the optimum moisture content.

Calculations

Calculate the moisture content and the dry weight of the soil as compacted for each trial, as follows:

$$w = \frac{A - B}{B - C} \times 100$$

And

$$W = \frac{W1}{W + 100} \times 100$$

Where:

w = Percentage of moisture in the specimen

A = weight of container and wet soil

B = weight of container and dried soil,

C = weight of container

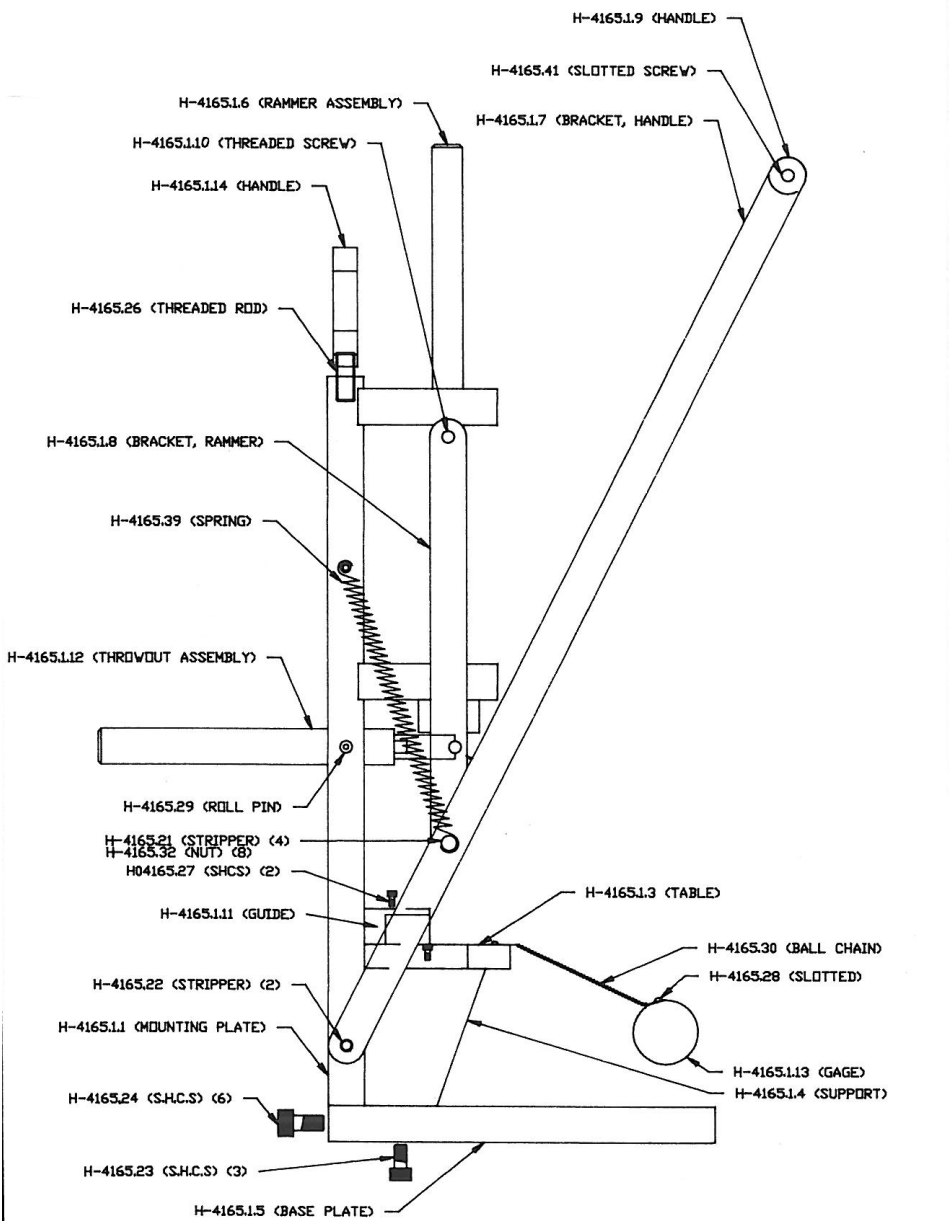
W = dry weight, in pounds per cubic foot of compacted soil and

w1 = wet weight, in pounds per cubic foot

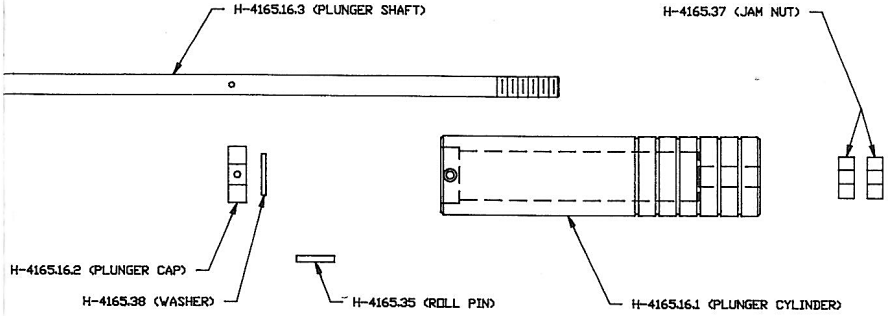
Moisture-Density Relationship
The calculations in Section-6 shall be made to determine the moisture content and corresponding oven-dry weight (density) for each of the compacted soil samples. The oven-dry weights per cubic foot (densities) of the soil shall be plotted as ordinates and corresponding moisture contents as abscissas.

Optimum Moiture Content
When the densities and corresponding moisture contents for the soil have been determined and plotted as indicated in paragraph, it will be found that by connecting the plotted points with a smooth line, a curve is produced. The moisture content corresponding to the peak of the curve shall be termed the "optimum moisture content" of the soil under the above compaction.

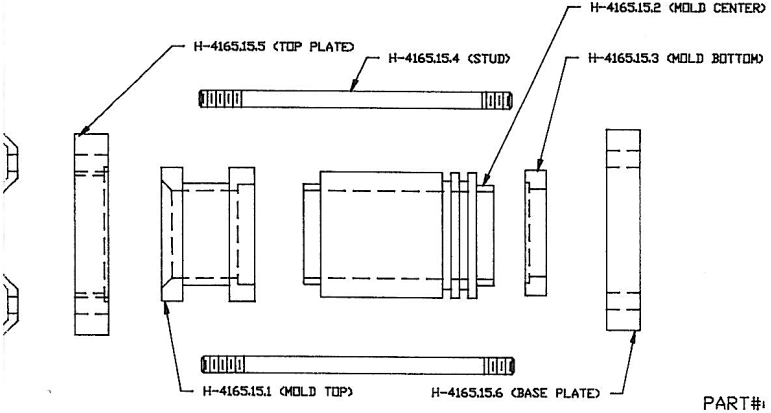
Maximum Density
The oven-dry weight per cubic foot of the soil at "optimum moisture content" shall be termed "maximum density" under the above compaction.



PART#: H-4165.1
DESC: COMPACTION MACHINE ASSEMBLY
REF: H-4165.1.BOM



PART#: H-4165.16
DESC: TAMPER ROD ASSEMBLY
REF: H-4165.16 BOM



PART#: H-4165.15
DESC: MOLD ASSEMBLY
REF: H-4165.15.BOM

Warranty

Humboldt Mfg. Co. warrants its products to be free from defects in material or workmanship. The exclusive remedy for this warranty is Humboldt Mfg. Co., factory replacement of any part or parts of such product, for the warranty of this product please refer to Humboldt Mfg. Co. catalog on Terms and Conditions of Sale. The purchaser is responsible for the transportation charges. Humboldt Mfg. Co. shall not be responsible under this warranty if the goods have been improperly maintained, installed, operated or the goods have been altered or modified so as to adversely affect the operation, use performance or durability or so as to change their intended use. The Humboldt Mfg. Co. liability under the warranty contained in this clause is limited to the repair or replacement of defective goods and making good, defective workmanship.

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